May 13, 1941. E. P. MEIXSELL 2,241,718

COMPRESSOR OR VACUUM PUMP

Filed April 23, 1940

Fig. 1.

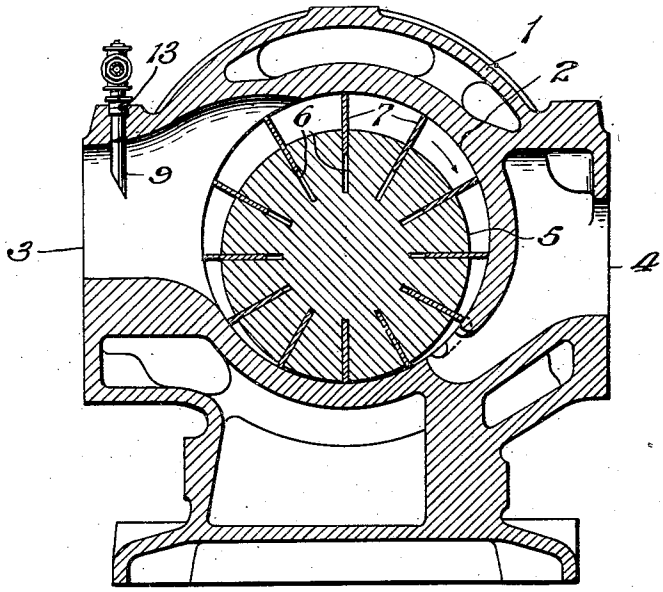


Fig. 3.

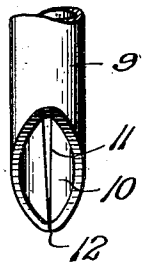


Fig. 4.

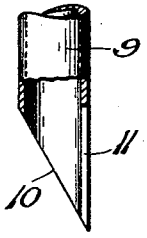
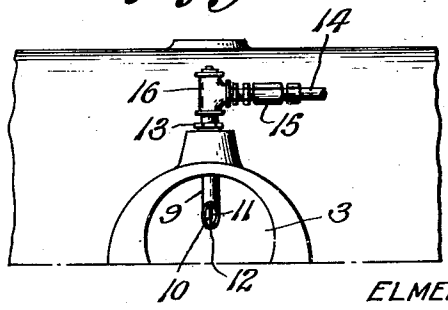


Fig. 2.



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COMPRESSOR OR VACUUM PUMP

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2 Claims. (Cl. 230—207)

This invention relates to rotary air compressors and pumps which include a stator casing housing an eccentrically mounted rotor which carries a plurality of sliding vanes making contact centrifugally with the casing wall. More particularly, the invention is concerned with a novel compressor or pump of the sliding vane type which includes improved means for lubricating the relatively moving parts thereof so that the apparatus is adapted for high speed and high pressure operation.

Compressors and pumps of the sliding vane type have been used for many years and the problem of lubricating the vanes has become increasingly difficult of solution with the demands for machines capable of operation at higher speeds and pressures. In the operation of such a machine, the vanes, which are mounted in slots in the rotor, move in and out as the latter rotates and unless the vanes are covered with a thin film of oil over their entire surfaces, they become extremely hot and are likely to stick in the slots. Also, if the lubrication is incomplete or non-uniform, the outward movement of the vanes after they pass the point of nearest approach to the stator wall may be delayed momentarily after which, the vanes move outward very rapidly and strike the stator wall with great violence. If the vanes are made of a hard material, such as Swedish steel, the continued hammering action referred to forms longitudinal ridges in the stator wall, while if the vanes are made of a synthetic resin or like material, the outer edges of the vanes are damaged by the hammering. In either case, the efficiency of the apparatus is impaired.

Various attempts have been made heretofore to lubricate the vanes and stator walls of these machines, as, for example, the Pfeiffer Patent No. 1,890,003 discloses the introduction of lubricant at the base of the rotor slots in controlled amounts. While this method of lubrication is satisfactory in devices operating at low speeds and pressures, it is inadequate and expensive when used in high speed and pressure apparatus. It is also objectionable in that its use necessitates the provision of special means for removing excess lubricant. For this purpose, grooves leading to the discharge port are formed in the stator wall, but such grooves produce serious wear on the vanes, so that frequent replacement is required. Moreover, in common with other methods of lubrication, the patented system does not produce uniform distribution of the oil, so that uneconomical quantities of the latter must be employed.

Another expedient that has been proposed involves utilizing the incoming air as a carrier for the lubricant, but the prior apparatus of this type with which I am familiar has not been successful because the lubricant has not been uniformly delivered to the moving parts. Moreover, in such apparatus, the lubricating oil has not been delivered into the air stream in such manner and in such relation to the position of the moving parts as to obtain maximum efficiency from the lubricant being used and certain of the devices referred to are not susceptible of control of the amount of lubricant being supplied and are, therefore, unreliable in operation and likely to be uneconomical.

The present invention is, accordingly, directed to the provision of a novel compressor or vacuum pump of the sliding vane type in which means are provided for delivering controlled quantities of lubricant to the moving parts with uniform distribution of the lubricant thereon. The desired result is obtained by making use of a lubricant supply means which has a discharge orifice lying within the incoming air stream and is so constructed that the lubricant being delivered is atomized and thus entrained by the air in the form of a fine mist or spray. The position of the discharge is such as to insure the delivery of lubricant to the vanes as they approach their outermost positions and the supply is under positive control so that only such amount of lubricant is used as is required and waste is thereby avoided.

The new compressor and vacuum pump include the usual stator casing provided with a central bore having one or more air inlets on one side and an air outlet on the other side. The bore is cylindrical and within it is eccentrically mounted a rotor having radial slots in which are mounted sliding vanes. The eccentricity of the mounting of the rotor is such that at one point between the inlet and outlet ports, the surface of the rotor lies close to the inner wall of the stator and with this arrangement, there is a crescent-shaped space between the rotor and stator which is subdivided into compartments by the vanes.

The lubricant is delivered into the incoming air stream by a quill discharge device so constructed that the lubricant discharged therefrom is atomized by the air and picked up and carried along thereby. The inlet port in the apparatus is eccentric relative to the rotor axis, being disposed on the side of the axis opposite to the seal, and the discharge point for the oil is at the side of the axis of the inlet port opposite to the seal. The incoming air stream carrying the lubricant, accordingly, impinges upon the vanes as they are more or less exposed beyond the slots and the oil comes in contact with the entire exposed portions of the vanes as the rotor rotates. The vanes returning to the innermost positions carry the oil therewith and the surfaces of the vanes and the walls of the slots are thereby covered with a film of the lubricating material.

For a better understanding of the invention,

reference may be had to the accompanying drawing, in which:

Fig. 1 is a view in transverse section of one form of the apparatus embodying the invention;

Fig. 2 is a fragmentary elevation of the inlet side of the apparatus;

Fig. 3 is a view in elevation of the end portion of the lubricating tube; and

Fig. 4 is an elevational view, partly in section, at right angles to Fig. 3.

The machine illustrated in the drawing comprises a stator casing 1 having a cylindrical bore 2 and air inlet and outlet openings 3 and 4 on opposite sides of the bore. A rotor 5 is mounted eccentrically within the bore and has a plurality of radial slots 6 in which are mounted sliding vanes 7. The eccentric mounting of the rotor within the bore is such that the surfaces of the rotor and the wall of the bore lie so close together at one point as to form an air seal in accordance with the usual practise. The air inlet port communicates with the crescent-shaped air space between the wall of the bore and the surface of the rotor remote from the seal, and the axis of the port is on the side of the axis of the rotor opposite to the seal. The air entering the port thus passes directly to the crescent-shaped chamber and impinges upon the side of the vanes while they are moving outward.

Mounted in an opening through the wall of the inlet port and extending into the interior of the port is a lubricator 9 which may conveniently take the form of a tube having its lower end cut off at an angle to its axis to provide an elliptical opening 10 which faces the incoming air. In the wall opposite the opening is a V-shaped orifice 11 which may be formed by cutting a lengthwise slot in the wall of the tube and forcing the end walls of the slot together, as indicated at 12. The lubricator tube is held in place in any suitable manner as by a nut 13 and it is supplied with lubricant through a line 14 which communicates with the tube 9 through a check valve 15 and a suitable fitting 16. The lubricant is forced through the line 14 by any suitable feed device which can be controlled and the check valve is employed to prevent escape of air or gas backward into the line 14.

In the operation of the apparatus, the lubricant flows down the inner wall of the tube 9 into the path of that portion of the air stream which enters the opening 10 and escapes through the opening 11. Because of the relatively small size of opening 11, air pressure is built up on the incoming side thereof and the oil or other lubricant employed is forced through opening 11 and atomized. As a result of the increased velocity which the air flowing through opening 11 attains, the atomized oil is dispersed throughout the air stream and is thus distributed on the vanes, rotor, and inner cylinder bore.

It will be observed that the lower end of the lubricator 9 lies above the axis of the port 3 and preferably the center of the opening 10 lies approximately half way between that axis and the upper wall of the port. With this arrangement, the lubricant is properly distributed on the desired surfaces and important savings in lubricant are effected. Thus, one type of compressor provided with the new lubricating device requires four drops of oil per minute, while a compressor of the Pfeiffer type, operated under the same conditions, requires eighteen drops of lubricant per minute. At the start of operations of the new device, the feed is ordinarily adjusted to supply an excess of oil until the parts become well lubricated, after which the feed is cut down and throughout the remainder of the operation, the oil is supplied in the small amounts indicated. Because of the small quantity of oil required with the new device, it is unnecessary to provide means for taking care of excess lubricant.

I claim:

1. A rotary compressor comprising a stator casing having a central bore, a cylindrical rotor provided with radial slots, vanes slidable within the slots, the rotor being arranged eccentrically within the bore between heads at each end of the casing, thereby forming a seal between the inner casing wall at one point and a crescent shaped space opposite the seal, said casing having a passage at that side of the rotor where the crescent shaped space is increasing in magnitude, in the direction of rotation of the rotor, said passage terminating in an inlet port for said crescent shaped space continuously communicating therewith at substantially its point of greatest magnitude, said casing having an outlet port on the opposite side, lubricating means within said passage having its outlet spaced from the walls thereof and to the side of the longitudinal axis of the passage adjacent the point of maximum magnitude of the crescent shaped space, whereby lubricant is atomized by the incoming gases passing through said passage and continuously is carried to the crescent shaped space and deposited on the back of the vanes when said vanes are positioned at substantially their point of maximum extension.

2. A rotary compressor comprising a stator casing having a central bore, a cylindrical rotor provided with radial slots, vanes slidable within the slots, the rotor being arranged eccentrically within the bore between heads at each end of the casing, thereby forming a seal between the inner casing wall at one point and a crescent shaped space opposite the seal, said casing having a passage at that side of the rotor where the crescent shaped space is increasing in magnitude, in the directiton of rotation of the rotor, said passage terminating in an inlet port for said crescent shaped space continuously communicating therewith at substantially its point of greatest magnitude, the passage having its longitudinal axis substantially perpendicular to a plane through the longitudinal axis of the rotor and the point of maximum magnitude of the crescent shaped space and the axis of the passage being positioned to the side of the longitudinal axis of the rotor adjacent the crescent shaped space, said casing having an outlet port on the opposite side, lubricating means within the passage having its outlet space substantially midway between the wall thereof and the longitudinal axis of the passage at the side of the passage adjacent the crescent shaped space, said lubricating means comprising a tubular conduit terminating in an elliptical opening formed by cutting the tubular conduit at an acute angle to its longitudinal axis, a narrow longitudinal air passageway in the wall of the tube opposite the elliptical opening extending from a point adjacent its extremity, whereby lubricant is atomized by the incoming gases passing through said passage and continuously is carried to the crescent shaped space and deposited on the back of the vanes when said vanes are positioned at substantially their point of maximum extension.

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